TANK FOUNDATION
STRUCTURE CALCULATION

STORAGE TANK 1500KL

4	15/02/2013	TRJ	Issued For Construction	HJR	HJR		
3	13/02/2013	TRJ	Issued For Construction	HJR	HJR		
2	08/02/2013	TRJ	Issued For Construction	HJR	HJR		
1	17/01/2013	TRJ	Issued For Construction	HJR	HJR		
0	22/10/2012	TRJ	Issued For Construction	HJR	HJR		
REV.	**DATE**	**BY**	**DESCRIPTION**	**CHK**	**APP**		
				EE		Approved by Client	

End User:

DARMA HENWA

Client:

DARMA HENWA

Designed & Manufactured by:

PT. DINAMIKA MITRA SEJATI

Design Code :	**ASME VIII DIV. 1, 2 2010 EDITION +2011 ADDENDA,**
Project Title :	Purchase Order No.
-	-
-	

Job No.	Document No.	Status	Revision
EE-012-02	**EE-012-02-STR**	**For Construction**	**4**

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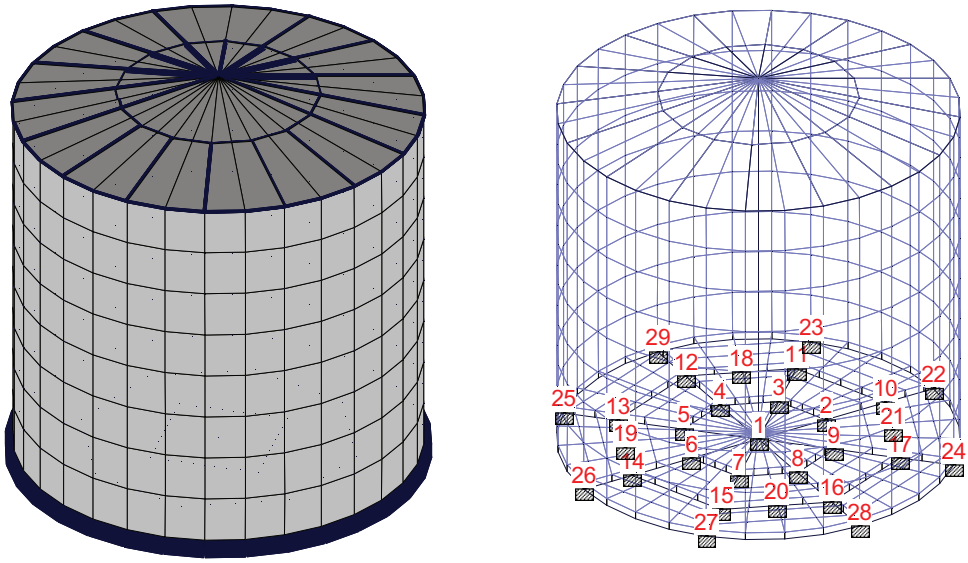
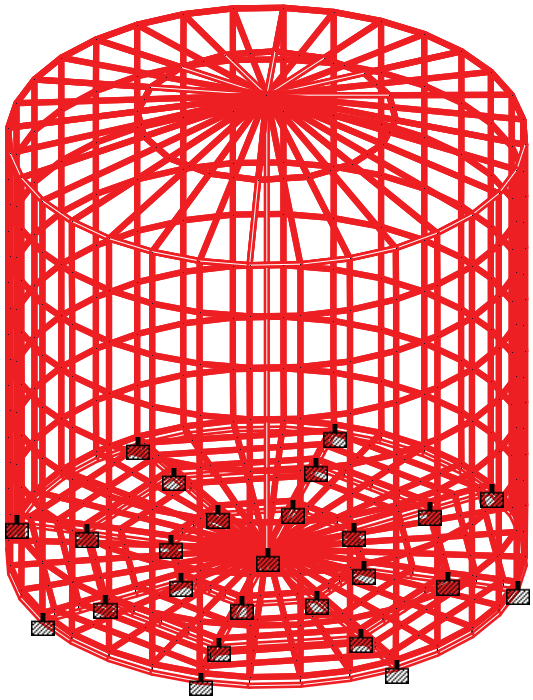
1. PENDAHULUAN

Analisis konstruksi pondasi fuel storage tank ini menggunakan permodelan struktur 3D dengan bantuan software STAAD PRO. Dari hasil analisis struktur, akan diperoleh besarnya reaksi perletakan untuk proses perhitungan struktur poer, kolom pendek dan sloof.

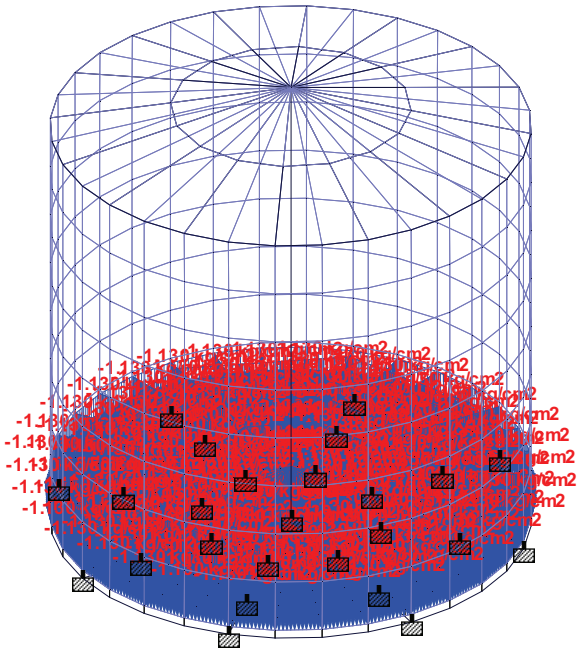
2. MODEL



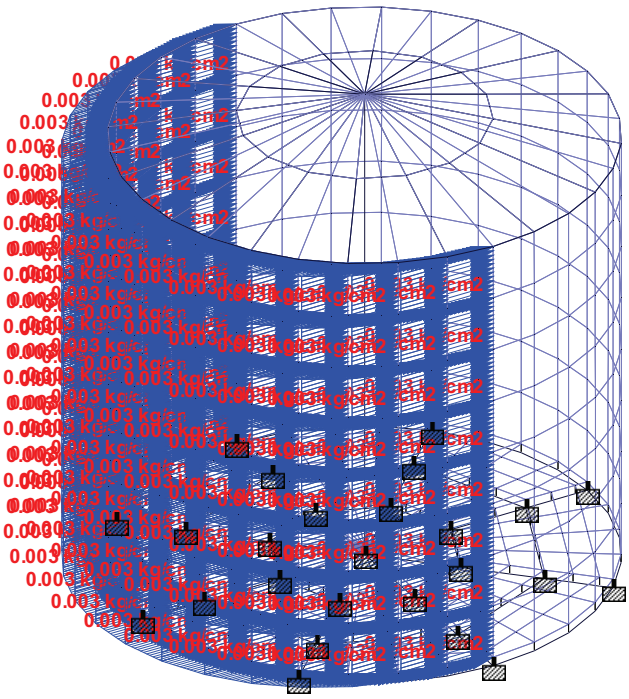
Gambar 2.1 Whole Structural Model



Gambar 2.2 Dead Load



Gambar 2.3 Live Load



Gambar 2.4 Wind Load

3. PEMBEBANAN

Kombinasi Pembebanan :

- 1.4D
- 1,2D + 1,6L
- 1,2D + L + 1,6W
- 1,2D + L – 1,6W
- 0,9D +1,6W
- 0,9D – 1,6W
- 1,4D + 1,4L
- 1,0D + 1,0L

4. SUPPORT REACTION

Node	L/C	Horizontal FX (kg)	Vertical FY (kg)	Horizontal FZ (kg)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
1	4:1.4D	0.025	10.7E 3	0.036	-0.000	-0.006	-0.000
	5:1.2D+1.6L	0.070	104E 3	-0.143	-0.000	-0.314	-0.000
	6:1.2D+L+1.6W	-0.419	68.7E 3	-0.112	-0.000	-0.198	0.002
	7:1.2D+L-1.6W	0.523	68.7E 3	-0.044	-0.000	-0.199	-0.002
	8:0.9D+1.6W	-0.455	6.85E 3	-0.011	-0.000	-0.004	0.002
	9:0.9D-1.6W	0.487	6.89E 3	0.057	-0.000	-0.004	-0.002
	10:1.4D+1.4L	0.068	94E 3	-0.116	-0.000	-0.277	-0.000
	11:1.0D+1.0L	0.048	67.2E 3	-0.083	-0.000	-0.198	-0.000
2	4:1.4D	8.821	3.07E 3	-84.850	0.038	0.030	-2.080
	5:1.2D+1.6L	2.41E 3	65.7E 3	-2.96E 3	1.455	0.689	29.629
	6:1.2D+L+1.6W	1.51E 3	42E 3	-1.88E 3	0.921	0.440	17.850
	7:1.2D+L-1.6W	1.5E 3	42E 3	-1.87E 3	0.922	0.441	17.849
	8:0.9D+1.6W	7.444	1.97E 3	-56.331	0.024	0.019	-1.336
	9:0.9D-1.6W	3.897	1.97E 3	-52.763	0.024	0.020	-1.338
	10:1.4D+1.4L	2.11E 3	58.2E 3	-2.61E 3	1.283	0.611	25.405
	11:1.0D+1.0L	1.51E 3	41.6E 3	-1.86E 3	0.916	0.436	18.146
3	4:1.4D	66.491	3.07E 3	53.308	-1.497	-0.027	-1.444
	5:1.2D+1.6L	3.79E 3	65.7E 3	378.366	19.875	-0.462	22.006
	6:1.2D+L+1.6W	2.39E 3	42E 3	251.050	11.942	-0.297	13.288
	7:1.2D+L-1.6W	2.39E 3	42E 3	256.176	11.939	-0.298	13.292
	8:0.9D+1.6W	41.494	1.97E 3	31.707	-0.961	-0.017	-0.930
	9:0.9D-1.6W	43.994	1.97E 3	36.832	-0.964	-0.018	-0.926
	10:1.4D+1.4L	3.33E 3	58.2E 3	344.397	17.016	-0.411	18.894
	11:1.0D+1.0L	2.38E 3	41.6E 3	245.998	12.154	-0.294	13.496
4	4:1.4D	-84.892	3.07E 3	-8.852	-2.080	0.030	-0.038
	5:1.2D+1.6L	-2.96E 3	65.7E 3	-2.4E 3	29.624	0.686	-1.457
	6:1.2D+L+1.6W	-1.89E 3	42E 3	-1.51E 3	17.852	0.440	-0.924
	7:1.2D+L-1.6W	-1.87E 3	42E 3	-1.5E 3	17.841	0.436	-0.921
	8:0.9D+1.6W	-63.816	1.97E 3	-10.529	-1.332	0.021	-0.026
	9:0.9D-1.6W	-45.331	1.97E 3	-0.852	-1.343	0.017	-0.023
	10:1.4D+1.4L	-2.61E 3	58.2E 3	-2.1E 3	25.401	0.608	-1.284
	11:1.0D+1.0L	-1.86E 3	41.6E 3	-1.5E 3	18.144	0.434	-0.917
5	4:1.4D	53.616	3.07E 3	-66.390	-1.444	-0.027	1.498
	5:1.2D+1.6L	378.351	65.7E 3	-3.79E 3	22.003	-0.465	-19.873
	6:1.2D+L+1.6W	248.411	42E 3	-2.38E 3	13.287	-0.299	-11.938
	7:1.2D+L-1.6W	258.994	42E 3	-2.4E 3	13.289	-0.300	-11.940
	8:0.9D+1.6W	29.176	1.97E 3	-33.897	-0.930	-0.017	0.963
	9:0.9D-1.6W	39.759	1.97E 3	-51.462	-0.928	-0.018	0.962
	10:1.4D+1.4L	344.461	58.2E 3	-3.33E 3	18.892	-0.414	-17.014
	11:1.0D+1.0L	246.043	41.6E 3	-2.38E 3	13.494	-0.295	-12.153
6	4:1.4D	-8.915	3.07E 3	85.012	-0.038	0.030	2.080
	5:1.2D+1.6L	-2.4E 3	65.7E 3	2.96E 3	-1.457	0.688	-29.627
	6:1.2D+L+1.6W	-1.51E 3	42E 3	1.88E 3	-0.924	0.436	-17.849
	7:1.2D+L-1.6W	-1.5E 3	42E 3	1.88E 3	-0.921	0.443	-17.848
	8:0.9D+1.6W	-6.584	1.97E 3	54.448	-0.026	0.016	1.337
	9:0.9D-1.6W	-4.878	1.97E 3	54.853	-0.023	0.023	1.338
	10:1.4D+1.4L	-2.11E 3	58.2E 3	2.61E 3	-1.284	0.609	-25.404
	11:1.0D+1.0L	-1.5E 3	41.6E 3	1.86E 3	-0.917	0.435	-18.145
7	4:1.4D	-66.406	3.07E 3	-53.651	1.498	-0.027	1.444
	5:1.2D+1.6L	-3.79E 3	65.7E 3	-378.643	-19.872	-0.464	-22.003
	6:1.2D+L+1.6W	-2.4E 3	42E 3	-258.501	-11.937	-0.296	-13.288
	7:1.2D+L-1.6W	-2.38E 3	42E 3	-249.292	-11.940	-0.302	-13.287
	8:0.9D+1.6W	-50.080	1.97E 3	-39.094	0.964	-0.015	0.928
	9:0.9D-1.6W	-35.299	1.97E 3	-29.885	0.961	-0.020	0.929
	10:1.4D+1.4L	-3.33E 3	58.2E 3	-344.725	-17.014	-0.413	-18.892
	11:1.0D+1.0L	-2.38E 3	41.6E 3	-246.232	-12.153	-0.295	-13.494
8	4:1.4D	85.179	3.07E 3	8.867	2.080	0.030	0.038
	5:1.2D+1.6L	2.96E 3	65.7E 3	2.4E 3	-29.628	0.690	1.456
	6:1.2D+L+1.6W	1.87E 3	42E 3	1.51E 3	-17.854	0.443	0.919
	7:1.2D+L-1.6W	1.88E 3	42E 3	1.5E 3	-17.843	0.438	0.924
	8:0.9D+1.6W	46.317	1.97E 3	7.784	1.332	0.022	0.022
	9:0.9D-1.6W	63.199	1.97E 3	3.617	1.343	0.017	0.027
	10:1.4D+1.4L	2.61E 3	58.2E 3	2.1E 3	-25.404	0.611	1.283
	11:1.0D+1.0L	1.86E 3	41.6E 3	1.5E 3	-18.146	0.437	0.916

9	4:1.4D	-53.467	3.07E 3	67.007	1.444	-0.027	-1.497
	5:1.2D+1.6L	-375.045	65.7E 3	3.79E 3	-22.010	-0.470	19.880
	6:1.2D+L+1.6W	-254.321	42E 3	2.39E 3	-13.292	-0.304	11.942
	7:1.2D+L-1.6W	-248.857	42E 3	2.39E 3	-13.292	-0.301	11.946
	8:0.9D+1.6W	-37.104	1.97E 3	45.747	0.928	-0.019	-0.964
	9:0.9D-1.6W	-31.639	1.97E 3	40.404	0.928	-0.016	-0.961
	10:1.4D+1.4L	-341.531	58.2E 3	3.33E 3	-18.898	-0.418	17.021
	11:1.0D+1.0L	-243.951	41.6E 3	2.38E 3	-13.498	-0.299	12.158
10	4:1.4D	-256.597	3.53E 3	-192.065	6.104	0.056	-5.133
	5:1.2D+1.6L	4.57E 3	91.4E 3	-7.6E 3	231.745	-7.988	-91.010
	6:1.2D+L+1.6W	2.73E 3	58.3E 3	-4.82E 3	146.816	-4.979	-58.619
	7:1.2D+L-1.6W	2.81E 3	58.3E 3	-4.81E 3	146.789	-4.970	-58.443
	8:0.9D+1.6W	-204.973	2.26E 3	-130.652	3.938	0.032	-3.388
	9:0.9D-1.6W	-124.938	2.27E 3	-116.289	3.911	0.041	-3.212
	10:1.4D+1.4L	3.93E 3	80.9E 3	-6.7E 3	204.303	-6.976	-80.917
	11:1.0D+1.0L	2.81E 3	57.8E 3	-4.79E 3	145.931	-4.983	-57.798
11	4:1.4D	-43.558	3.53E 3	312.215	-7.948	-0.054	0.693
	5:1.2D+1.6L	8.56E 3	91.4E 3	2.09E 3	-228.916	8.225	99.746
	6:1.2D+L+1.6W	5.27E 3	58.2E 3	1.37E 3	-145.632	5.154	62.495
	7:1.2D+L-1.6W	5.41E 3	58.2E 3	1.44E 3	-145.623	5.093	62.633
	8:0.9D+1.6W	-98.384	2.26E 3	165.058	-5.114	-0.004	0.377
	9:0.9D-1.6W	42.381	2.27E 3	236.362	-5.105	-0.065	0.514
	10:1.4D+1.4L	7.48E 3	80.8E 3	1.91E 3	-202.289	7.183	87.451
	11:1.0D+1.0L	5.34E 3	57.7E 3	1.36E 3	-144.492	5.131	62.465
12	4:1.4D	-192.226	3.53E 3	256.143	-5.130	0.054	-6.104
	5:1.2D+1.6L	-7.61E 3	91.4E 3	-4.58E 3	-90.989	-8.072	-231.852
	6:1.2D+L+1.6W	-5.08E 3	58.3E 3	-2.78E 3	-58.549	-4.959	-147.069
	7:1.2D+L-1.6W	-4.55E 3	58.3E 3	-2.77E 3	-58.485	-5.097	-146.671
	8:0.9D+1.6W	-386.248	2.27E 3	159.861	-3.330	0.103	-4.123
	9:0.9D-1.6W	139.101	2.26E 3	169.466	-3.266	-0.034	-3.725
	10:1.4D+1.4L	-6.71E 3	80.9E 3	-3.94E 3	-80.898	-7.049	-204.397
	11:1.0D+1.0L	-4.79E 3	57.8E 3	-2.82E 3	-57.784	-5.035	-145.998
13	4:1.4D	317.197	3.53E 3	47.369	0.689	-0.053	7.951
	5:1.2D+1.6L	2.09E 3	91.4E 3	-8.53E 3	99.915	8.204	228.653
	6:1.2D+L+1.6W	1.17E 3	58.3E 3	-5.16E 3	62.619	5.177	145.230
	7:1.2D+L-1.6W	1.65E 3	58.3E 3	-5.48E 3	62.718	5.044	145.698
	8:0.9D+1.6W	-36.494	2.27E 3	190.951	0.394	0.033	4.877
	9:0.9D-1.6W	444.318	2.26E 3	-130.048	0.492	-0.101	5.346
	10:1.4D+1.4L	1.91E 3	80.9E 3	-7.45E 3	87.598	7.165	202.059
	11:1.0D+1.0L	1.36E 3	57.8E 3	-5.32E 3	62.570	5.118	144.328
14	4:1.4D	257.830	3.53E 3	192.760	-6.105	0.055	5.135
	5:1.2D+1.6L	-4.57E 3	91.4E 3	7.61E 3	-231.798	-8.007	91.018
	6:1.2D+L+1.6W	-2.84E 3	58.3E 3	4.79E 3	-146.784	-4.983	58.384
	7:1.2D+L-1.6W	-2.7E 3	58.3E 3	4.84E 3	-146.889	-4.990	58.690
	8:0.9D+1.6W	99.710	2.27E 3	102.444	-3.872	0.039	3.148
	9:0.9D-1.6W	231.786	2.26E 3	145.391	-3.977	0.032	3.454
	10:1.4D+1.4L	-3.93E 3	80.9E 3	6.7E 3	-204.350	-6.992	80.925
	11:1.0D+1.0L	-2.81E 3	57.8E 3	4.79E 3	-145.964	-4.994	57.804
15	4:1.4D	47.873	3.53E 3	-316.717	7.951	-0.052	-0.689
	5:1.2D+1.6L	-8.53E 3	91.4E 3	-2.09E 3	228.647	8.207	-99.911
	6:1.2D+L+1.6W	-5.52E 3	58.3E 3	-1.57E 3	145.508	5.039	-62.820
	7:1.2D+L-1.6W	-5.11E 3	58.3E 3	-1.24E 3	145.412	5.186	-62.512
	8:0.9D+1.6W	-172.765	2.27E 3	-365.987	5.159	-0.107	-0.597
	9:0.9D-1.6W	234.317	2.26E 3	-41.221	5.063	0.039	-0.289
	10:1.4D+1.4L	-7.45E 3	80.9E 3	-1.9E 3	202.054	7.168	-87.594
	11:1.0D+1.0L	-5.32E 3	57.8E 3	-1.36E 3	144.324	5.120	-62.567
16	4:1.4D	188.457	3.53E 3	-258.389	5.134	0.056	6.101
	5:1.2D+1.6L	7.52E 3	91.4E 3	4.5E 3	91.257	-7.945	231.344
	6:1.2D+L+1.6W	4.52E 3	58.2E 3	2.76E 3	58.656	-5.017	146.417
	7:1.2D+L-1.6W	5E 3	58.2E 3	2.7E 3	58.715	-4.879	146.686
	8:0.9D+1.6W	-116.150	2.27E 3	-134.393	3.271	-0.033	3.787
	9:0.9D-1.6W	358.452	2.26E 3	-197.821	3.329	0.105	4.056
	10:1.4D+1.4L	6.63E 3	80.8E 3	3.88E 3	81.133	-6.938	203.951
	11:1.0D+1.0L	4.74E 3	57.7E 3	2.77E 3	57.952	-4.956	145.680
17	4:1.4D	-316.399	3.53E 3	-43.313	-0.688	-0.051	-7.952
	5:1.2D+1.6L	-2.11E 3	91.3E 3	8.52E 3	-99.476	8.087	-228.725
	6:1.2D+L+1.6W	-1.51E 3	58.2E 3	5.35E 3	-62.396	5.013	-145.623
	7:1.2D+L-1.6W	-1.33E 3	58.2E 3	5.27E 3	-62.392	5.063	-145.395
	8:0.9D+1.6W	-293.345	2.26E 3	9.543	-0.445	-0.058	-5.226

	9:0.9D-1.6W	-113.454	2.27E 3	-65.231	-0.440	-0.008	-4.997
	10:1.4D+1.4L	-1.92E 3	80.8E 3	7.44E 3	-87.214	7.063	-202.122
	11:1.0D+1.0L	-1.37E 3	57.7E 3	5.31E 3	-62.296	5.045	-144.373
18	4:1.4D	82.763	1.49E 3	-196.541	0.251	0.002	0.105
	5:1.2D+1.6L	3.61E 3	55.5E 3	-8.58E 3	32.160	-0.022	13.402
	6:1.2D+L+1.6W	2.22E 3	35.2E 3	-5.45E 3	20.208	-0.000	8.351
	7:1.2D+L-1.6W	2.34E 3	35.2E 3	-5.41E 3	20.154	-0.026	8.470
	8:0.9D+1.6W	-4.332	961.613	-145.140	0.188	0.014	0.008
	9:0.9D-1.6W	110.741	958.132	-107.556	0.134	-0.011	0.127
	10:1.4D+1.4L	3.18E 3	49E 3	-7.56E 3	28.203	-0.019	11.753
	11:1.0D+1.0L	2.27E 3	35E 3	-5.4E 3	20.145	-0.013	8.395
19	4:1.4D	-197.767	1.49E 3	-82.186	0.106	0.001	-0.254
	5:1.2D+1.6L	-8.67E 3	55.6E 3	-3.63E 3	13.561	-0.003	-32.480
	6:1.2D+L+1.6W	-5.51E 3	35.2E 3	-2.24E 3	8.448	0.012	-20.400
	7:1.2D+L-1.6W	-5.45E 3	35.2E 3	-2.35E 3	8.572	-0.016	-20.363
	8:0.9D+1.6W	-158.807	958.115	1.830	0.006	0.015	-0.181
	9:0.9D-1.6W	-95.464	962.079	-107.498	0.130	-0.014	-0.145
	10:1.4D+1.4L	-7.63E 3	49E 3	-3.19E 3	11.892	-0.003	-28.483
	11:1.0D+1.0L	-5.45E 3	35E 3	-2.28E 3	8.495	-0.002	-20.345
20	4:1.4D	-82.326	1.49E 3	197.640	-0.254	0.001	-0.106
	5:1.2D+1.6L	-3.63E 3	55.6E 3	8.66E 3	-32.478	-0.003	-13.564
	6:1.2D+L+1.6W	-2.41E 3	35.2E 3	5.42E 3	-20.327	-0.034	-8.635
	7:1.2D+L-1.6W	-2.17E 3	35.2E 3	5.53E 3	-20.434	0.030	-8.388
	8:0.9D+1.6W	-174.621	960.983	71.089	-0.109	-0.031	-0.192
	9:0.9D-1.6W	68.773	959.155	183.019	-0.217	0.032	0.055
	10:1.4D+1.4L	-3.19E 3	49E 3	7.63E 3	-28.482	-0.003	-11.895
	11:1.0D+1.0L	-2.28E 3	35E 3	5.45E 3	-20.344	-0.002	-8.496
21	4:1.4D	197.566	1.49E 3	80.926	-0.105	-0.000	0.254
	5:1.2D+1.6L	8.66E 3	55.6E 3	3.62E 3	-13.527	-0.015	32.431
	6:1.2D+L+1.6W	5.48E 3	35.2E 3	2.31E 3	-8.507	-0.014	20.348
	7:1.2D+L-1.6W	5.47E 3	35.2E 3	2.27E 3	-8.469	-0.006	20.353
	8:0.9D+1.6W	127.619	960.127	71.536	-0.086	-0.004	0.160
	9:0.9D-1.6W	126.395	960.030	32.512	-0.048	0.004	0.166
	10:1.4D+1.4L	7.63E 3	49E 3	3.19E 3	-11.862	-0.014	28.440
	11:1.0D+1.0L	5.45E 3	35E 3	2.28E 3	-8.473	-0.010	20.315
22	4:1.4D	-254.824	10.6E 3	38.334	-0.027	0.046	-6.043
	5:1.2D+1.6L	-6.71E 3	81.9E 3	1.46E 3	-1.601	2.471	-169.690
	6:1.2D+L+1.6W	-4.34E 3	56.4E 3	922.090	-1.002	1.557	-108.624
	7:1.2D+L-1.6W	-4.2E 3	52.8E 3	922.410	-1.017	1.561	-107.372
	8:0.9D+1.6W	-235.678	8.62E 3	24.484	-0.010	0.028	-4.511
	9:0.9D-1.6W	-91.953	4.97E 3	24.803	-0.025	0.032	-3.258
	10:1.4D+1.4L	-5.93E 3	74.3E 3	1.28E 3	-1.408	2.173	-149.989
	11:1.0D+1.0L	-4.24E 3	53.1E 3	916.774	-1.006	1.552	-107.135
23	4:1.4D	-201.059	10.7E 3	153.662	-4.243	-0.053	-4.311
	5:1.2D+1.6L	-5.79E 3	82.5E 3	3.73E 3	-119.277	-1.818	-120.734
	6:1.2D+L+1.6W	-4.11E 3	56.3E 3	2.03E 3	-76.951	-1.185	-76.467
	7:1.2D+L-1.6W	-3.25E 3	53.7E 3	2.73E 3	-74.872	-1.121	-77.222
	8:0.9D+1.6W	-557.311	8.16E 3	-249.892	-3.767	-0.066	-2.394
	9:0.9D-1.6W	298.807	5.54E 3	447.458	-1.688	-0.002	-3.149
	10:1.4D+1.4L	-5.12E 3	74.8E 3	3.3E 3	-105.428	-1.604	-106.720
	11:1.0D+1.0L	-3.65E 3	53.4E 3	2.36E 3	-75.306	-1.146	-76.229
24	4:1.4D	-158.782	10.7E 3	-197.869	4.205	-0.048	-4.354
	5:1.2D+1.6L	-3.85E 3	82.6E 3	-5.64E 3	119.399	-1.796	-120.435
	6:1.2D+L+1.6W	-2.89E 3	56.4E 3	-3.24E 3	77.006	-1.106	-76.304
	7:1.2D+L-1.6W	-2.03E 3	53.8E 3	-3.93E 3	74.946	-1.170	-77.039
	8:0.9D+1.6W	-532.905	8.18E 3	219.737	3.734	0.001	-2.432
	9:0.9D-1.6W	328.757	5.56E 3	-474.140	1.673	-0.063	-3.167
	10:1.4D+1.4L	-3.41E 3	75E 3	-4.98E 3	105.526	-1.584	-106.469
	11:1.0D+1.0L	-2.44E 3	53.5E 3	-3.56E 3	75.375	-1.131	-76.050
25	4:1.4D	156.721	10.6E 3	207.104	-4.361	-0.056	4.220
	5:1.2D+1.6L	3.79E 3	82.3E 3	5.74E 3	-121.323	-1.971	119.209
	6:1.2D+L+1.6W	765.366	53E 3	5.12E 3	-76.803	-1.509	75.163
	7:1.2D+L-1.6W	4.07E 3	56.8E 3	2.2E 3	-77.655	-0.991	76.561
	8:0.9D+1.6W	-1.55E 3	4.92E 3	1.59E 3	-2.377	-0.295	2.014
	9:0.9D-1.6W	1.75E 3	8.74E 3	-1.33E 3	-3.230	0.223	3.411
	10:1.4D+1.4L	3.36E 3	74.7E 3	5.08E 3	-107.248	-1.738	105.363
	11:1.0D+1.0L	2.4E 3	53.3E 3	3.63E 3	-76.606	-1.242	75.259
26	4:1.4D	257.431	10.6E 3	-38.177	-0.025	0.046	6.071
	5:1.2D+1.6L	6.74E 3	82.4E 3	-1.45E 3	1.111	2.441	170.105

	6:1.2D+L+1.6W	4.09E 3	52.2E 3	-919.245	0.700	1.540	107.106
	7:1.2D+L-1.6W	4.49E 3	57.6E 3	-918.814	0.672	1.541	109.428
	8:0.9D+1.6W	-34.915	4.13E 3	-24.758	-0.002	0.030	2.742
	9:0.9D-1.6W	365.898	9.55E 3	-24.327	-0.030	0.030	5.063
	10:1.4D+1.4L	5.96E 3	74.8E 3	-1.28E 3	0.966	2.147	150.360
	11:1.0D+1.0L	4.26E 3	53.4E 3	-913.575	0.690	1.534	107.400
27	4:1.4D	209.668	10.6E 3	-154.476	4.247	-0.055	4.338
	5:1.2D+1.6L	5.75E 3	82.4E 3	-3.79E 3	119.483	-1.967	121.075
	6:1.2D+L+1.6W	2.01E 3	53E 3	-3.88E 3	75.627	-0.986	76.348
	7:1.2D+L-1.6W	5.31E 3	56.8E 3	-954.240	76.458	-1.508	77.785
	8:0.9D+1.6W	-1.51E 3	4.92E 3	-1.56E 3	2.315	0.226	2.071
	9:0.9D-1.6W	1.78E 3	8.75E 3	1.36E 3	3.146	-0.297	3.507
	10:1.4D+1.4L	5.08E 3	74.7E 3	-3.35E 3	105.610	-1.735	107.025
	11:1.0D+1.0L	3.63E 3	53.4E 3	-2.39E 3	75.436	-1.239	76.447
28	4:1.4D	-34.811	10.6E 3	-260.565	6.179	0.051	-0.460
	5:1.2D+1.6L	-1.3E 3	82.1E 3	-6.75E 3	170.914	2.902	-4.388
	6:1.2D+L+1.6W	-2.77E 3	55.7E 3	-4.39E 3	108.985	2.044	-2.323
	7:1.2D+L-1.6W	1.13E 3	53.7E 3	-4.21E 3	108.629	1.616	-3.458
	8:0.9D+1.6W	-1.97E 3	7.86E 3	-255.275	4.150	0.246	0.271
	9:0.9D-1.6W	1.93E 3	5.76E 3	-79.736	3.794	-0.181	-0.863
	10:1.4D+1.4L	-1.14E 3	74.5E 3	-5.97E 3	151.094	2.552	-3.955
	11:1.0D+1.0L	-816.610	53.2E 3	-4.26E 3	107.925	1.823	-2.825
29	4:1.4D	22.390	10.6E 3	253.658	-6.048	0.042	-0.224
	5:1.2D+1.6L	1.46E 3	82.2E 3	6.7E 3	-169.741	2.493	-0.924
	6:1.2D+L+1.6W	-1.03E 3	55.8E 3	4.36E 3	-108.213	1.367	-0.095
	7:1.2D+L-1.6W	2.87E 3	53.7E 3	4.17E 3	-107.851	1.777	-1.204
	8:0.9D+1.6W	-1.93E 3	7.87E 3	258.168	-4.069	-0.177	0.410
	9:0.9D-1.6W	1.96E 3	5.77E 3	67.963	-3.707	0.232	-0.699
	10:1.4D+1.4L	1.28E 3	74.6E 3	5.93E 3	-150.035	2.192	-0.864
	11:1.0D+1.0L	914.322	53.3E 3	4.23E 3	-107.168	1.566	-0.617

5. PERHITUNGAN STRUKTUR

1.1. Perencanaan Balok I

Direncanakan :

Balok 350 x 500		
Lebar, b	= 350	mm
Tinggi, h	= 500	mm
Tebal Selimut beton	= 40	mm
Tinggi Efektif, d = (500 - 40 - 13)	= 447	mm
Tulangan Utama	= D16	
Tulangan Sengkang	= D13	
Mutu Beton K-350,fc'	= 35	Mpa
Mutu Tulangan U-32,fy	= 320	Mpa

Data Perhitungan :

Vu (adopt from Staad Pro)	= 104000	kg
Mu (adopt from Staad Pro)	= 26.629	kNm
	= 26,629,000.00	Nmm

$$\rho_{min} = \frac{1.4}{f_y}$$

ρ_{min}= 1.4/320
= 0.004

$$\rho_{max} = 0.75 \times \frac{0.85 \times f_c' \times \beta}{f_y} \times \frac{600}{600 + f_y}$$

ρ_{max}= 0.75 x (0.85 x 35 x 0.85 / 320) x (600 / (600 + 320))
= 0.039

Penulangan Balok :

$$Rn = \frac{Mu}{0.8 \times b \times d^2}$$

Rn = 26629000 / (0.8 x 350 x 447^2)
= 0.476 Mpa

$$w = 0.85 \times \left(1 - \sqrt{\frac{1 - 2.353 \times Rn}{f_c'}}\right)$$

w = 0.85 x (1 - (1 - (2.353 x 0.476 / 35))^1/2)
= 0.014

$$\rho = w \times \frac{f_c'}{f_y}$$

ρ = 0.01371 x 35 / 320
= 0.0015

karena ρ < ρ_{min} = 0.00438

karena ρ < ρ_{max} = 0.03866

Pakai ρ = 0.00438

$$As = \rho \times b \times d$$

As = 0.00438 x 350 x 447

= 685.3 mm^2

$$As' = 0.2 \times As$$

As' = 0.2 x 685.251

= 137.1 mm^2

Tulangan Atas = (As + As') / 2

= (685.251 + 137.0502) / 2

= 411.1506 mm^2 **3 D16**

Tulangan Bawa = (As + As') / 2

= (685.251 + 137.0502) / 2

= 411.1506 mm^2 **3 D16**

Penulangan Geser :

$$V_c = \frac{1}{6}\sqrt{f_c'} \times b \times d$$

V_c = 1/6 x (35^0.5) x 350 x 447

= 154,261.78 N

= 15,426.18 kg

$$V_n = \frac{V_u}{0.6}$$

V_n = 104000 /0.6

= 173,333.33 kg **=>> Perlu Tulangan Geser!!**

Dipakai Sengkang = D13

Jarak Sengkang, s = 200 mm

Av = 253 mm^2

$$V_{sa} = \frac{Av \times f_y \times d}{s}$$

V_{sa} = (253.4 x 320 x 447) / 200

= 181,231.68 N

= 18,123.17 kg **> Vc, OK!**

1.2. Perencanaan Balok II

Direncanakan :

Balok 400 x 500		
Lebar, b	= 400	mm
Tinggi, h	= 500	mm
Tebal Selimut beton	= 40	mm
Tinggi Efektif, d = (500 - 40 - 13)	= 447	mm
Tulangan Utama	= D16	
Tulangan Sengkang	= D13	
Mutu Beton K-350,fc'	= 35	Mpa
Mutu Tulangan U-32,fy	= 320	Mpa

Data Perhitungan :

Vu (adopt from Staad Pro)	= 91400	kg
Mu (adopt from Staad Pro)	= 231.852	kNm
	= 231,852,000.00	Nmm

$$\rho_{min} = \frac{1.4}{f_y}$$

ρ_{min}= 1.4/320
= 0.004

$$\rho_{max} = 0.75 \times \frac{0.85 \times f_c' \times \beta}{f_y} \times \frac{600}{600 + f_y}$$

ρ_{max}= 0.75 x (0.85 x 35 x 0.85 / 320) x (600 / (600 + 320))
= 0.039

Penulangan Balok :

$$Rn = \frac{Mu}{0.8 \times b \times d^2}$$

Rn = 231852000 / (0.8 x 400 x 447^2)
= 3.627 Mpa

$$w = 0.85 \times \left(1 - \sqrt{\frac{1 - 2.353 \times Rn}{f_c'}}\right)$$

w = 0.85 x (1 - (1 - (2.353 x 3.627 / 35))^1/2)
= 0.111

$$\rho = w \times \frac{f_c'}{f_y}$$

ρ = 0.11081 x 35 / 320
= 0.01212

karena ρ > ρ_{min} = 0.00438

karena ρ < ρ_{max} = 0.03866

Pakai ρ = 0.01212

$$As = \rho \times b \times d$$

As = 0.01212 x 400 x 447

= 2167 mm^2

$$As' = 0.2 \times As$$

As' = 0.2 x 2167.056

= 433.4 mm^2

Tulangan Atas = (As + As') / 2

= (2167.056 + 433.4112) / 2

= 1300.234 mm^2 **7 D16**

Tulangan Bawa = (As + As') / 2

= (2167.056 + 433.4112) / 2

= 1300.234 mm^2 **7 D16**

Penulangan Geser :

$$V_c = \frac{1}{6}\sqrt{f_c'} \times b \times d$$

V_c = 1/6 x (35^0.5) x 400 x 447

= 176,299.18 N

= 17,629.92 kg

$$V_n = \frac{V_u}{0.6}$$

V_n = 91400 /0.6

= 152,333.33 kg **=>> Perlu Tulangan Geser!!**

Dipakai Sengkang = D13

Jarak Sengkang, s = 200 mm

Av = 253 mm^2

$$V_{sa} = \frac{Av \times f_y \times d}{s}$$

V_{sa} = (253.4 x 320 x 447) / 200

= 181,231.68 N

= 18,123.17 kg **> Vc, OK!**

1.3. Perencanaan Balok III

Direncanakan :

Balok 400 x 500		
Lebar, b	= 400	mm
Tinggi, h	= 500	mm
Tebal Selimut beton	= 40	mm
Tinggi Efektif, d = (500 - 40 - 13)	= 447	mm
Tulangan Utama	= D16	
Tulangan Sengkang	= D13	
Mutu Beton K-350,fc'	= 35	Mpa
Mutu Tulangan U-32,fy	= 320	Mpa

Data Perhitungan :

Vu (adopt from Staad Pro)	= 82600	kg
Mu (adopt from Staad Pro)	= 170.914	kNm
	= 170,914,000.00	Nmm

$$\rho_{min} = \frac{1.4}{f_y}$$

ρ_{min}= 1.4/320
= 0.004

$$\rho_{max} = 0.75 \times \frac{0.85 \times f_c' \times \beta}{f_y} \times \frac{600}{600 + f_y}$$

ρ_{max}= 0.75 x (0.85 x 35 x 0.85 / 320) x (600 / (600 + 320))
= 0.039

Penulangan Balok :

$$Rn = \frac{Mu}{0.8 \times b \times d^2}$$

Rn = 170914000 / (0.8 x 400 x 447^2)
= 2.674 Mpa

$$w = 0.85 \times \left(1 - \sqrt{\frac{1 - 2.353 \times Rn}{f_c'}}\right)$$

w = 0.85 x (1 - (1 - (2.353 x 2.674 / 35))^1/2)
= 0.08

$$\rho = w \times \frac{f_c'}{f_y}$$

ρ = 0.08015 x 35 / 320
= 0.00877

karena ρ > ρ_{min} = 0.00438

karena ρ < ρ_{max} = 0.03866

Pakai ρ = 0.00877

$$As = \rho \times b \times d$$

As = 0.00877 x 400 x 447

= 1568 mm^2

$$As' = 0.2 \times As$$

As' = 0.2 x 1568.076

= 313.6 mm^2

Tulangan Atas = (As + As') / 2

= (1568.076 + 313.6152) / 2

= 940.8456 mm^2 **5 D16**

Tulangan Bawa = (As + As') / 2

= (1568.076 + 313.6152) / 2

= 940.8456 mm^2 **5 D16**

Penulangan Geser :

$$V_c = \frac{1}{6}\sqrt{f_c'} \times b \times d$$

V_c = 1/6 x (35^0.5) x 400 x 447

= 176,299.18 N

= 17,629.92 kg

$$V_n = \frac{V_u}{0.6}$$

V_n = 82600 /0.6

= 137,666.67 kg **=>> Perlu Tulangan Geser!!**

Dipakai Sengkang = D13

Jarak Sengkang, s = 200 mm

Av = 253 mm^2

$$V_{sa} = \frac{Av \times f_y \times d}{s}$$

V_{sa} = (253.4 x 320 x 447) / 200

= 181,231.68 N

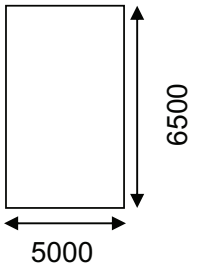
= 18,123.17 kg **> Vc, OK!**

1.4. Perencanaan Slab

Direncanakan :

Plate Thk.300		
Tebal, h	= 300	mm
Lebar, Lx	= 5000	mm
Panjang, Ly	= 6500	mm
Tebal Selimut beton, p	= 30	mm
Bentang terpanjang, ln	= 6500	mm
β = Ly/Lx	= 1.30	mm
Lebar plat per meter panjang, b	= 1000	mm
Tinggi Efektif, dx = (300 - 30 - (13 / 2))	= 263.5	mm
Tinggi Efektif, dx = (300 - 30 - 13 -(13 / 2))	= 250.5	mm
Tulangan Arah X	= D13	
Tulangan Arah Y	= D13	
Mutu Beton K-350,fc'	= 35	Mpa
Mutu Tulangan U-32,fy	= 320	Mpa
Berat Jenis Beton	= 2400	kg/m3

Data Perhitungan :



Vu = 1.2 DL + 1.6 LL
= (1.2 x 0.3 x 2400) + (1.6 x 12 x 0.8)
= 879.36 kg/m

$$Mu = 0.001 \times Vu \times Lx^2 \times x$$

Mu = 0.001 x 879.36 x 5^2 x 62
= 1,363.01 kgm
= 13,630,080.00 Nmm

$$\rho_{min} = \frac{1.4}{f_y}$$

ρ_{min}= 1.4/320
= 0.00438

$$\rho_{max} = \frac{\beta_1 \times 450}{600 + f_y} \times \frac{0.85 \times f_c'}{f_y}$$

ρ_{max}= ((0.75 x 450) / (600 + 320)) x ((0.85 x 35) / 320)
= 0.03411

Penulangan Plat :

$$Mn = \frac{Mu}{\phi \times b \times d^2}$$

Mn = 13630080 / (0.85 x 1000 x 263.5^2)
= 0.23095 N/mm^2

$$m = \frac{f_y}{0.85 \times f_c'}$$

m = 320 / (0.85 x 35)
= 10.7563

$$\rho = \frac{1}{m}\left(1 - \sqrt{\left(1 - \frac{2 \times Mn \times m}{f_y}\right)}\right)$$

ρ = (1 / 10.757) x (1 - (1 - (2 x 0.23096 x 10.757 / 320))^0.5)
= 0.0007245

karena ρ < ρ_{min} = 0.00438
karena ρ < ρ_{max} = 0.03411
Pakai ρ = 0.00438

$$As = \rho \times b \times d$$

As = 0.00438 x 1000 x 263.5
= 1154.13 mm^2 **dipasang** **D13 - 100**

Penulangan Geser :

$$V_c = \frac{1}{6}\sqrt{f_c'} \times b \times d$$

V_c = 1/6 x (35^0.5) x 1000 x 263.5
= 259,814.50 N
= 25,981.45 kg

$$V_n = \frac{V_u}{0.6}$$

V_n = 879.36 /0.6
= 43,302.42 kg **=>> Perlu Tulangan Geser!!**

Dipakai Sengkang	= D13	
Jarak Sengkang, s	= 80	mm
Av	= 253.4	mm^2

$$V_{sa} = \frac{Av \times f_y \times d}{s}$$

V_{sa} = (253.4 x 320 x 263.5) / 80
= 267,083.60 N
= 26,708.36 kg **> Vc, OK!**

1.5. Perencanaan Strouss

Direncanakan :

Strouss Dia.400		
Diameter, D	= 400	mm
Tebal Selimut beton, p	= 30	mm
Diameter Efektif, d = (400 - 30 - (16 / 2))	= 362	mm
B	= 1000	mm
Tulangan Utama	= D16	
Tulangan Sengkang	= d10	
Mutu Beton K-350,fc'	= 35	Mpa
Mutu Tulangan U-32,fy	= 320	Mpa
Luas penampang ujung tiang, A	= 125,663.71	mm2
	= 1,256.64	cm2
Keliling tiang, O	= 1,256.64	mm
	= 125.66	cm

Data Tanah :

Nilai konus, qc	= 250	kg/cm2
Nilai hambatan lekat per pias, JHF	= 525.30	kg/cm
Faktor keamanan, Sf	= 3	

Data Perhitungan :

Vu (adopt from Staad Pro)	= 104000	kg
qu (adopt from Staad Pro Load Comb 11)	= 67200	kg
Mu (adopt from Staad Pro)	= 186.611	kNm
	= 186,611,000.00	Nmm

Cek Daya Dukung Tanah :

Daya Dukung Ujung Strouss

$$qe = \frac{qc \times A}{3} + \frac{JHF \times O}{5}$$

qe = (250 x 1256.64 / 3) + (525.3 x 125.67 / 5)
= 117,921.98 kg

Daya Dukung Lekatan

$$qs = JHP \times As$$

Lapisan	Kedalaman (m)	Ketebalan Lapisan Tanah (cm)	As (cm2)	JHP (kg/cm2)	qs (kg)
Lempung	0.0-6.4	640	80,424.77	0.70	56,297.34
Lempung berpasir	6.4-7.8	140	17,592.92	1.10	19,352.21
Pasir Berlempung	7.8-8.4	60	7,539.82	0.90	6,785.84
Pasir	8.4-9.2	80	10,053.10	1.30	13,069.03
				Total qs	**95,504.42**

Dari akumulai didapatkan
qs = 95,504.42 kg

Daya Dukung Ultimate Tanah

$$qult = qe + qs$$

qult = 117921.99 + 95504.42
= 213,426.40 kg

Daya Dukung Ijin tanah

$$q = \frac{qult}{Sf}$$

q = 213426.41 / 3
= 71,142.13 kg **< qu =>> Ok**

Penulangan Strouss :

$$\rho_{min} = \frac{1.4}{f_y}$$

ρ_{min}= 1.4/320
= 0.00438

$$\rho_{max} = 0.75 \times \frac{0.85 \times f_c' \times \beta}{f_y} \times \frac{600}{600 + f_y}$$

ρ_{max}= 0.75 x (0.85 x 35 x 0.85 / 320) x (600 / (600 + 320))
= 0.03866

$$k = \frac{Mu}{B \times d^2}$$

k = 186611000 / (1000 x 362^2)
= 1.42 Nmm

$$\rho = \frac{k}{0.9 \times f_y}$$

ρ = 1.43 / (0.9 x 320)
= 0.00495

karena ρ > ρ_{min} = 0.00438
karena ρ < ρ_{max} = 0.03866
Pakai ρ = 0.00495

$$As = \rho \times B \times d$$

As = 0.00495 x 1000 x 362
= 1791.9 mm^2 **dipakai** **10-D16**

Penulangan Geser :

$$Vn = \frac{Vu}{\varphi}$$

Vn = 104000 / 1.6
= 65000 kg

$$V_c = \frac{1}{6}\sqrt{f_c'} \times B \times d$$

Vc = 1/6 x (35^0.5) x 1000 x 362
= 110,986.74 N
= 11,098.67 kg

φVc = 0.6 x 11098.68
= 6,659.20 kg **< Vu =>> Perlu Tulangan Geser!!**

$$Av = 2 \times \frac{1}{4} \times \pi \times \phi$$

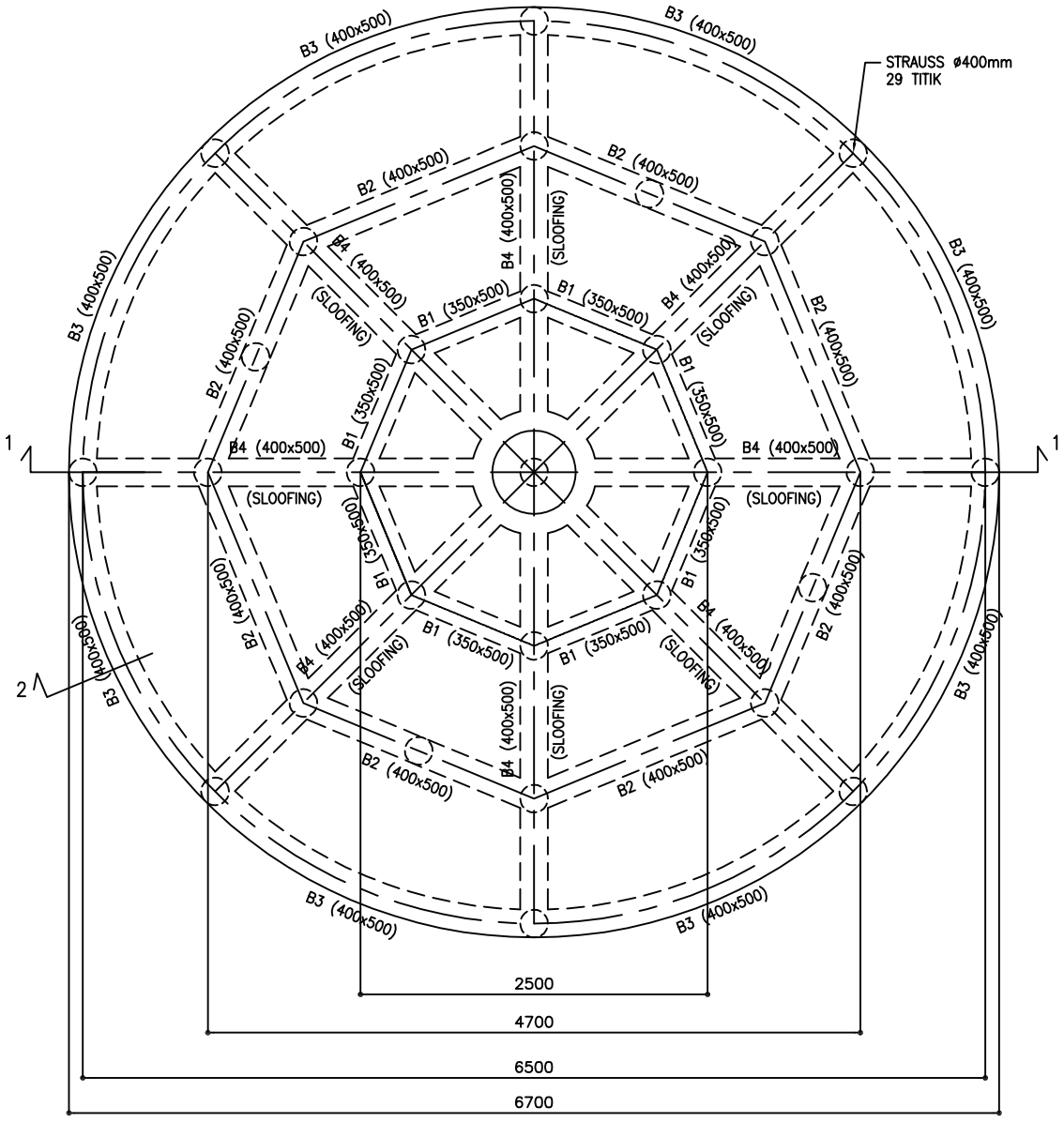
Av = 2 x 1/4 x 3.14 x 10^2
= 157.08 mm2

$$S = \frac{Av \times d \times f_y}{(Vn - Vc)}$$

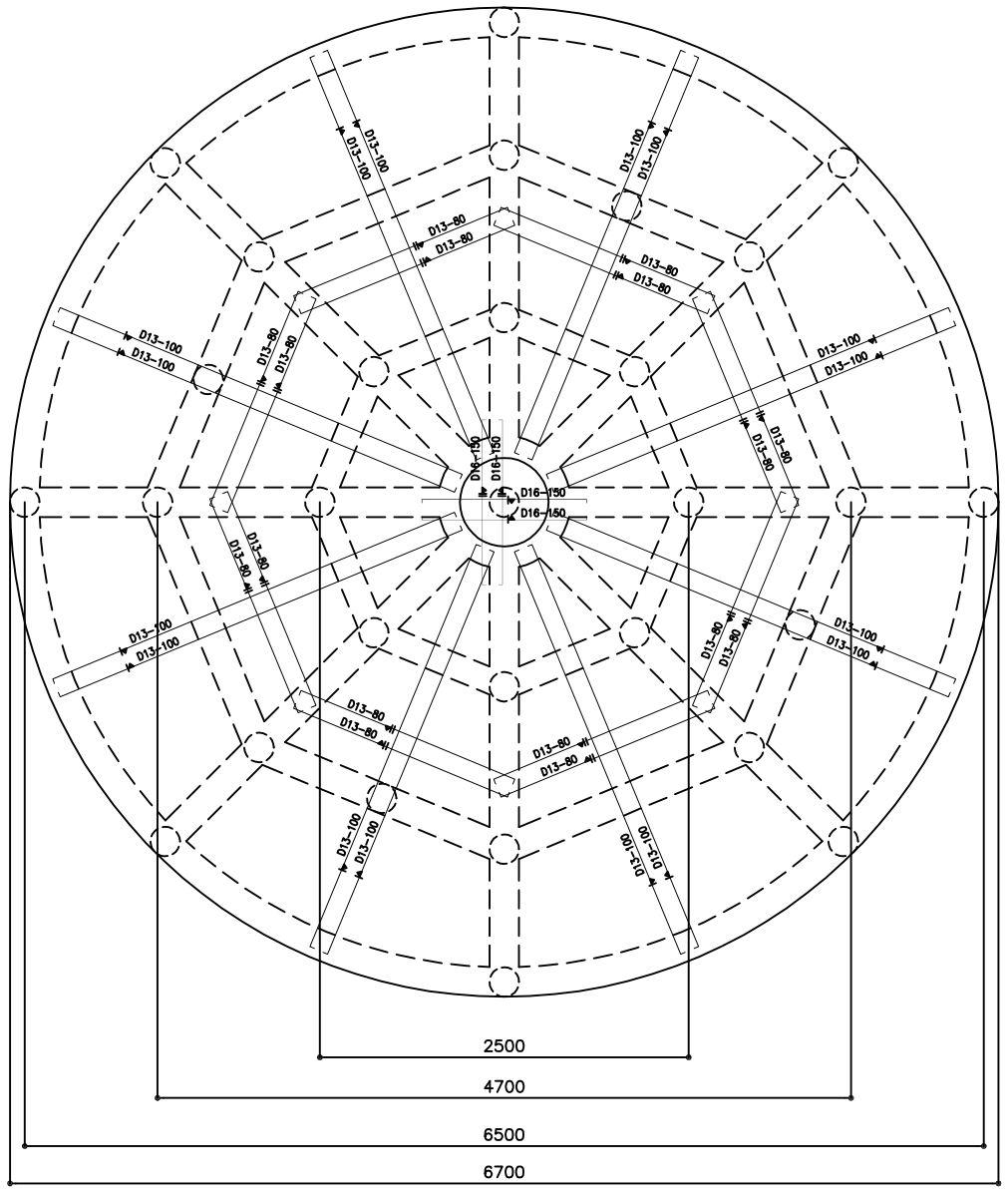
S = 157.08 x 362 x 320 / (65000 - 11098.68)
= 337.59 mm

Syarat S < 1/2d = 181 mm

Jadi Digunakan Tulangan Geser **ϕ10-150**



DENAH BALOK PONDASI
SKALA 1:50



DENAH PLAT PONDASI
SKALA 1:50

KETERANGAN :

= TULANGAN ATAS LAPIS PERTAMA
= TULANGAN BAWAH LAPIS PERTAMA
= TULANGAN ATAS LAPIS KEDUA
= TULANGAN BAWAH LAPIS KEDUA

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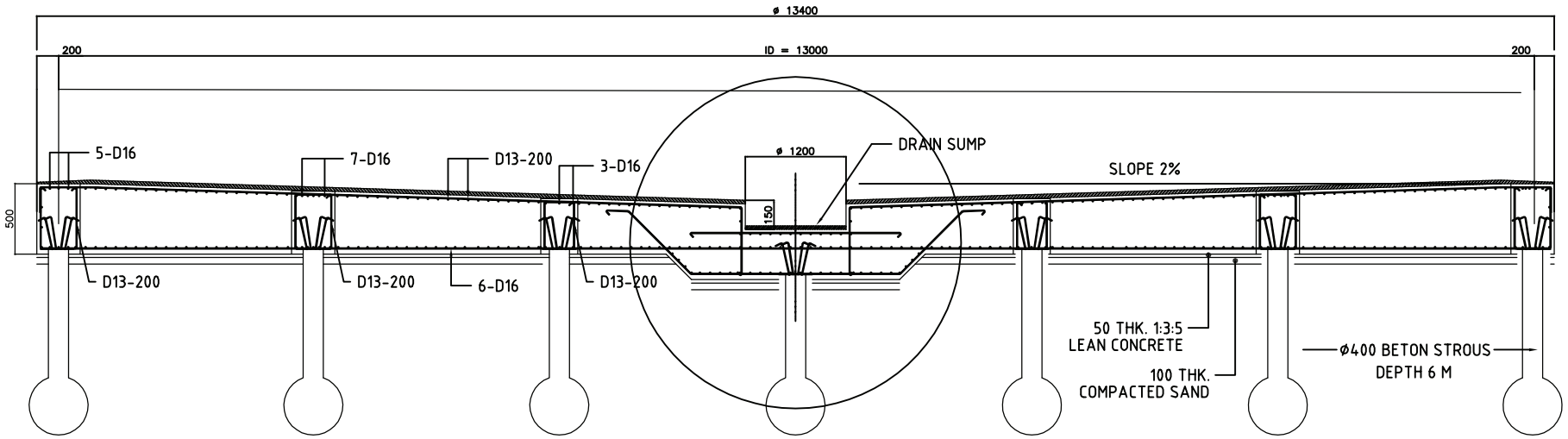
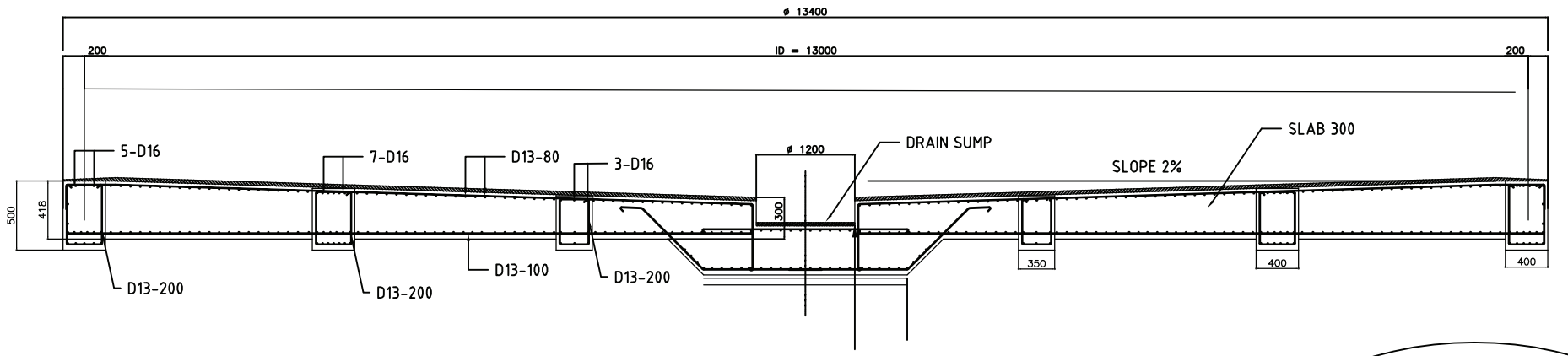
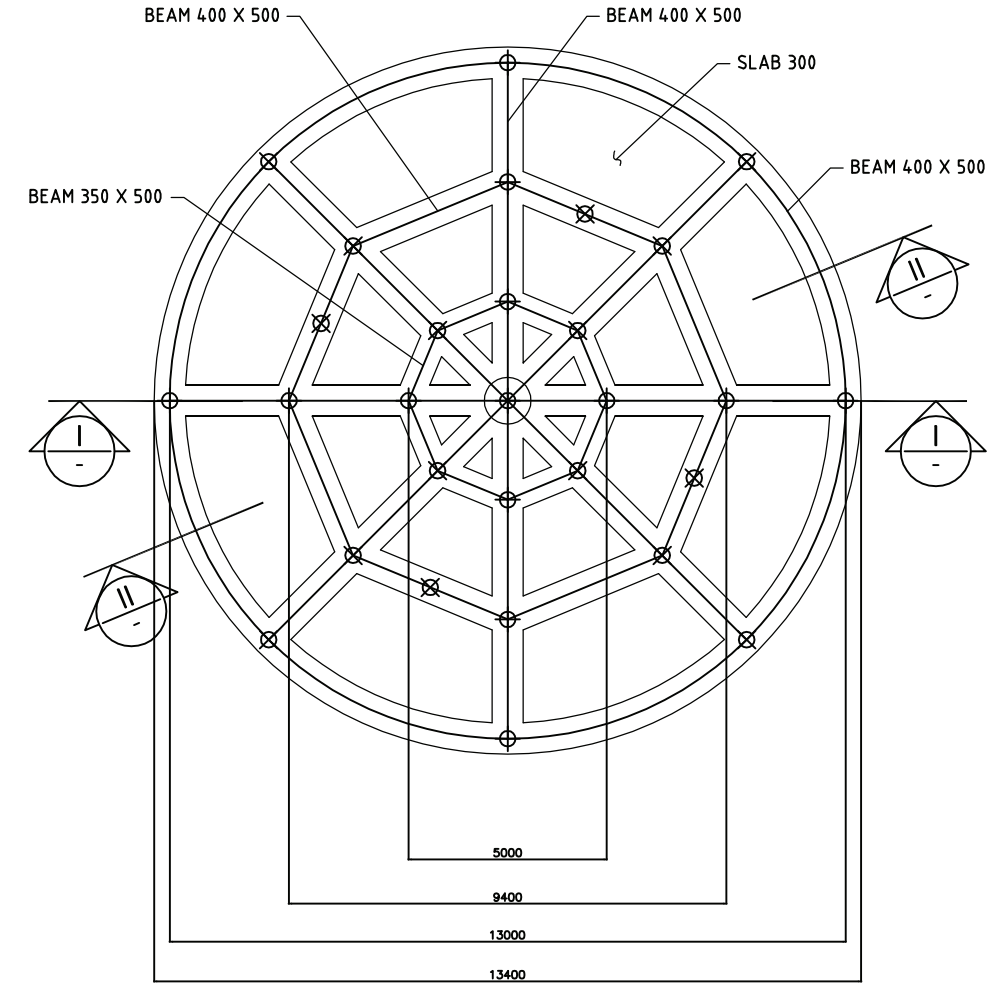
DENAH



SECTION I–I

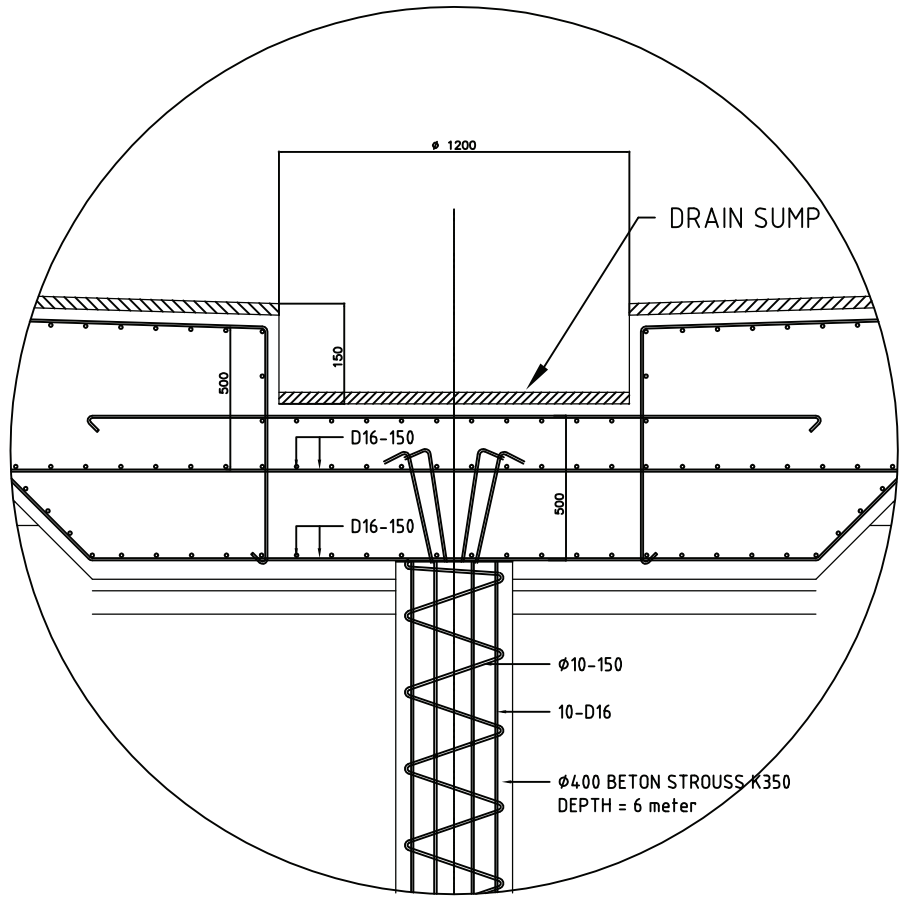


SECTION II–II



⊕ ø 400 BETON STROUSS, QTY. = 29 PILES DEPTH VARIANT SESUAI KONDISI DI LAPANGAN

PLAN OF FOUNDATION FOR 1.500T FUEL OIL STORAGE TANK



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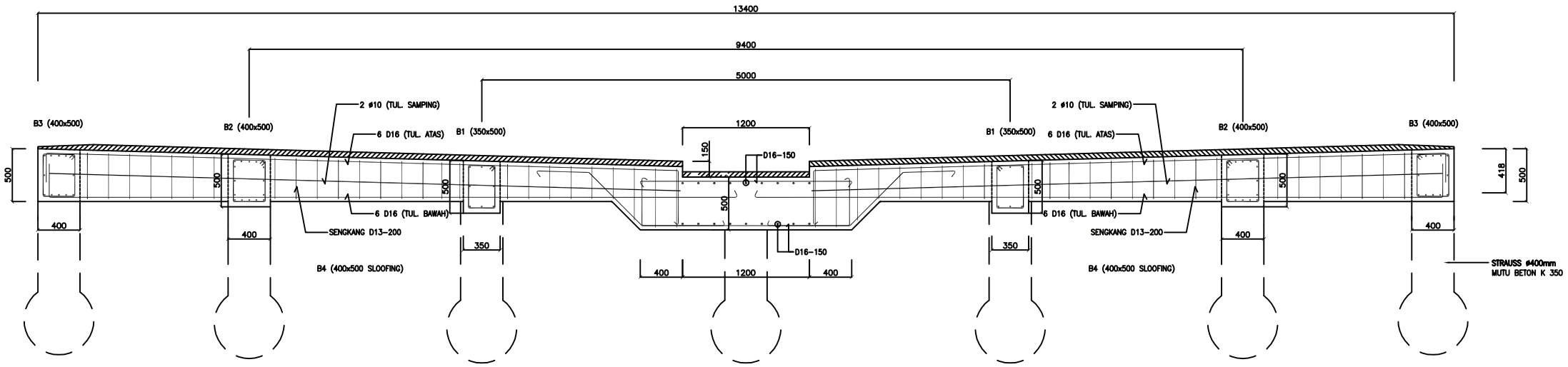
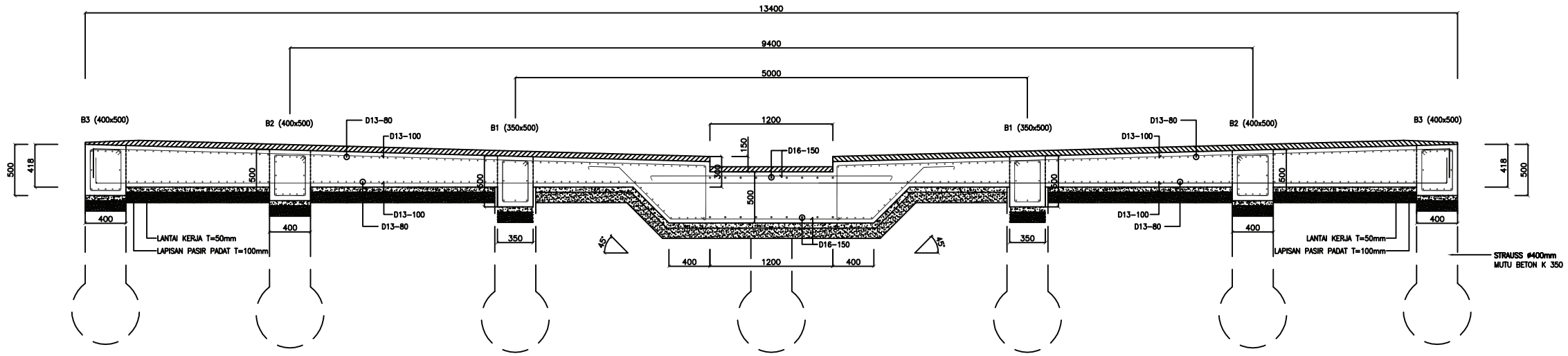
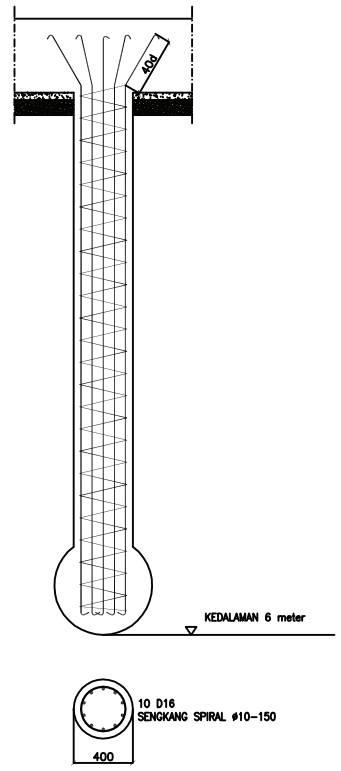
PLAN AND REINFORCING BARS



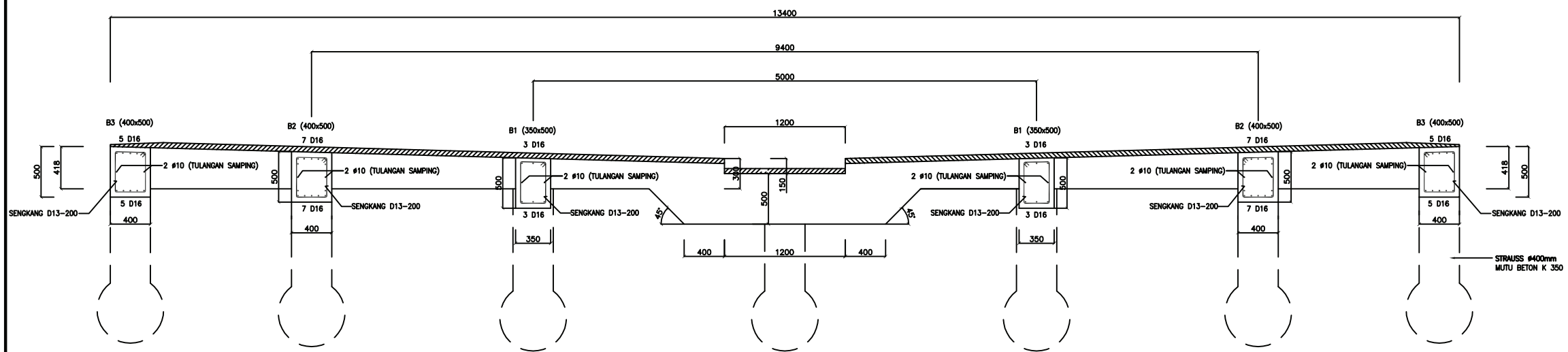
POTONGAN 1-1 (PENULANGAN BALOK B4)
SKALA 1:25 BALOK B4 JUMLAH 8 BUAH



POTONGAN 2-2 (PENULANGAN PLAT)
SKALA 1:25



DETAIL STRAUSS
SKALA 1:25



POTONGAN 2-2 (PENULANGAN BALOK)
SKALA 1:25

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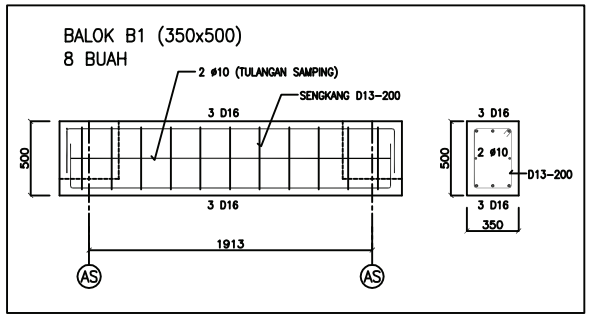
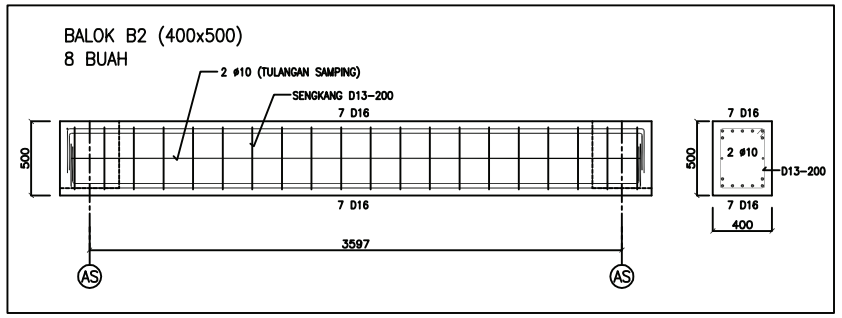
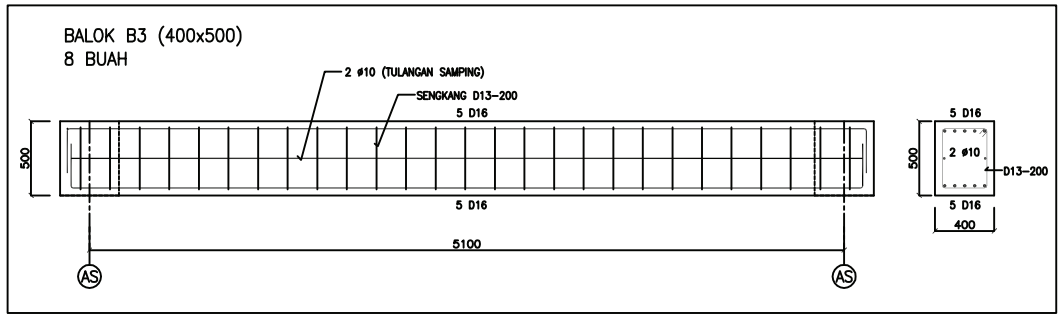
BALOK B1 (350x500)
8 BUAH



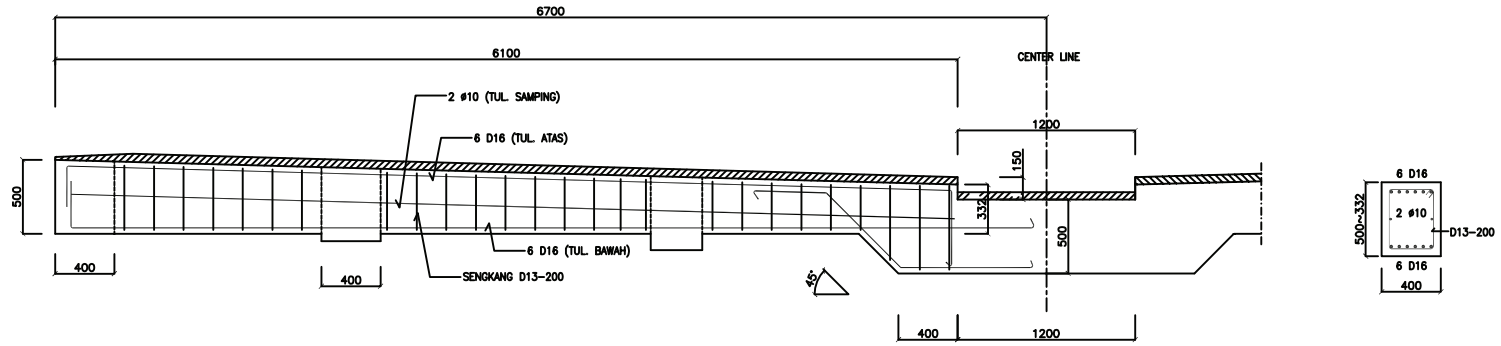
BALOK B2 (400x500)
8 BUAH



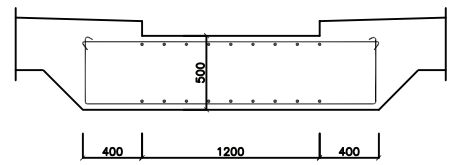
BALOK B3 (400x500)
8 BUAH



BALOK B4 (400x500 SLOOFING)
8 BUAH

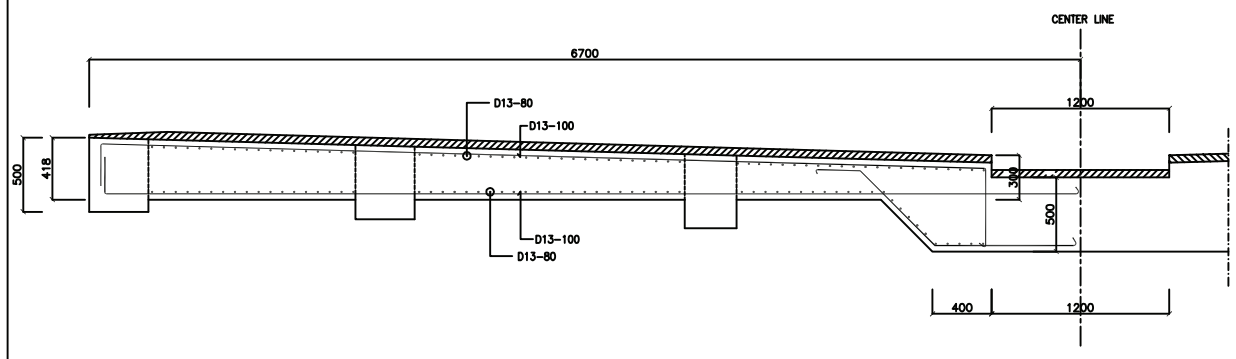


POER TEBAL 500mm



- TULANGAN ATAS ARAH X = 9 BUAH PANJANG 2,1 M
- TULANGAN BAWAH ARAH X = 9 BUAH PANJANG 2,95 M
- TULANGAN ATAS ARAH Y = 9 BUAH PANJANG 2,1 M
- TULANGAN BAWAH ARAH Y = 9 BUAH PANJANG 2,95 M

PLAT BETON
8 BUAH



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